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FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT

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COUNTRY USSR

DATE OF
INFORMATION 1950

SUBJECT Scientific - Engineering, hydraulic structures

HOW
PUBLISHED Monthly periodical

DATE DIST. 26 Jan 1952

WHERE
PUBLISHED Moscow

NO. OF PAGES 2

DATE
PUBLISHED Dec 1950

LANGUAGE Russian

SUPPLEMENT TO
REPORT NO.

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SOURCE Gidrotekhnicheskoye stroitel'stvo No 12, 1950, p 15,

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LINING CANALS WITH CONCRETE IN WINTER

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The method described here for lining a canal with concrete under winter conditions was used successfully at a southern hydroelectric power station during a mild winter.

The concrete mixture is put out by the plant as a half-dry mass which is not apt to freeze. When the mixture reaches the site where it is to be used, its temperature may be slightly above or even a little below freezing. In either case, the mixture must remain loose or lumpy.

The half-dry concrete is spread evenly over the side slope and bottom of the canal in a layer somewhat thicker than the planned thickness. The difference must be determined by experiment.

The concrete is tamped by an electric steam vibrator which consists of an ordinary surface vibrator with six or seven 15-20-cm sections of 18-25-mm gas pipe, forming short steam "needles" mounted on the lower part. The needles are connected to a steam line which is laid on top of the vibrator platform around the electric motor.

Current and steam are connected during the operation. The steam is turned on a little ahead of the current so that the openings in the needles will not become clogged with mortar.

The needles are submerged directly in the layer of concrete being tamped, saturating the concrete with water and heat from the condensation of the steam.

Experience has shown that the thawing and heating process in the concrete is more intensive than the wetting process. This circumstance permits raising the temperature of the concrete to 60-80° C without danger of thinning the mass so that it will run.

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To equalize wetting of the concrete, the pattern of depressions made by the steam needles may be made denser by shifting the platform only half its width or length. The tamped and heated portion should be covered with a heat-insulating material immediately after the vibrator is shifted.

In the case of a freezing or frozen foundation, all types of ground, with the exception of rock, may be heated by the method described. Heat saturation of the soil is important during severe freezes and is an effective measure for creating a stable thermal medium for a layer of concrete on the lining of a canal.

The combined vibrator can be used to good effect in tamping canal-side slopes planned for filled ground.

As indicated above, the heat saturation of concrete anticipates the calculated moisture requirement. Furthermore, the requisite density of the concrete is reached earlier, by comparison, than when a calculated amount of water is added in accordance with the proper water/cement ratio.

Using the procedure described, it is possible to use concrete with a water content lower than that established for a certain mix. Consequently, there is an increase in the strength of the concrete.

The proposed method does not require any extra connections.

Usually, there are electric and water lines along the canal trench, the water supply being mainly for spraying concrete in summer. In winter, the water line is used to feed a steam boiler.

The vibrators may also be supplied with steam from a mobile steam boiler with a sufficiently high steam output: 30-50 kg/sq m of area to be covered and a like amount for each square meter of foundation area. Required steam pressure is 0.3-1.0 atm.

The economic value of the method is based on the complete utilization of the heat introduced by the steam into the layer of concrete, on the reduction of heat losses by the concrete, and on the elimination of the necessity for heating the aggregate at the plant.

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